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# Development of the Air Force Precommission Screening Test-62

By

Lonnie D. Valentine, Jr.

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**DEVELOPMENT OF THE AIR FORCE  
PRECOMMISSION SCREENING TEST-62**

By  
**Lonnie D. Valentine, Jr.**

**Project 7717, Task 771706**

Personnel Laboratory  
**AERONAUTICAL SYSTEMS DIVISION  
AIR FORCE SYSTEMS COMMAND  
UNITED STATES AIR FORCE  
Lackland Air Force Base, Texas**

## **ABSTRACT**

The 1962 revision of the Air Force Precommission Screening Test replaces an earlier form for screening of applicants for navigator training and selection of airmen for the Air Force Academy Preparatory School. Sections of the test were constructed as short equivalent forms of five parts of the Air Force Officer Qualifying Test: verbal, quantitative, general science, mechanical, and scale reading. Results of a tryout of the new test with a high-aptitude sample of basic airmen demonstrated a suitable distribution of scores and high correlations between corresponding parts of the new test and AFOQT.

# DEVELOPMENT OF THE AIR FORCE PRECOMMISSION SCREENING TEST-62\*

This paper describes the Air Force Precommission Screening Test-62 (AFPST-62) and reports its psychometric characteristics. The AFPST-62 replaces AFPST, Form B, for screening of applicants for navigator training as aviation cadets, and for selection of applicants for the Air Force Academy Preparatory School.

## BACKGROUND AND RATIONALE

The AFPST-62 was designed as a short version of the Officer Quality and Navigator-Technical portions of the Air Force Officer Qualifying Test (AFOQT). It is assumed that maximal prediction of qualification on these two AFOQT composites can be achieved in this way. Table 1 compares the content of AFPST-62 and the portions of AFOQT it is designed to predict.

**TABLE 1. Content of AFPST-62 and a Typical AFOQT**

<u>AFPST SUBTEST</u>	<u>Equivalent AFOQT Subtest (or Composite)</u>
	<u>AFOQT Officer Quality Composite</u>
Part 1, Verbal	Verbal Composite
Vocabulary (6 items)	Vocabulary (15 items)
Verbal Analogies (15 items)	Verbal Analogies (30 items)
Background for Word Events (9 items)	Background for World Events (15 items)
-----	Reading Comprehension (15 items)
Part 2, Quantitative	Quantitative Composite
Interpretation of Data (6 items)	Interpretation of Data (15 items)
General Mathematics (12 items)	General Mathematics (30 items)
Arithmetic Reasoning (12 items)	Arithmetic Reasoning (30 items)
-----	Officer BI
	<u>AFOQT Navigator-Technical Composite</u>
Part 2, Quantitative (see above)	Quantitative Composite (see above)
Part 3, General Science (15 items)	General Science (30 items)
Part 4, Mechanical	
Mechanical Information (10 items)	Mechanical Information (30 items)
Mechanical Principles (20 items)	Mechanical Principles (30 items)
Part 5, Scale Reading (45 items)	Scale Reading (60 items)
-----	Aerial Landmarks (50 items)

\* Released by the author for publication as an ASD Technical Note in October 1951.



Operationally, AFPST-62 replaces AFPST, Form B (formerly entitled Air Force Cadet Screening Test, Form B). AFPST-62 differs from Form B in that, at the time it was constructed, Form B was used for screening of aviation cadet applicants for both pilot and navigator training; AFPST-62 is not used for pilot screening since pilot trainees are now recruited almost exclusively through the AFROTC program.

The present series of Air Force Precommission Screening Tests is a continuation of effort, begun in 1949, to develop a short test instrument for screening of aircrew applicants prior to administration of a longer and more sophisticated test battery to those men selected by the screening test. A more extensive description of past effort in the development of a screening test is presented in Valentine & Creager (1961).

At the present time, the AFPST is used in the screening of navigator training applicants, and in the selection of students for the Air Force Academy Preparatory School. Navigator training applicants must qualify for training on both the Officer Quality and Navigator-Technical composites. Air Force Academy Preparatory School students must ultimately qualify for the Academy on the College Entrance Examination Board verbal and quantitative tests. A single test can be used to predict both of these qualifying requirements because the Officer Quality Composite includes the same kind of verbal and quantitative measures as the College Entrance Examination Board tests.

### SELECTION OF TEST ITEMS

Since the AFPST-62 is a short parallel form of sections of a typical AFOQT, the following criteria governed selection of items:

- (1) The shorter AFPST subtests had to be highly homogeneous to insure reliable prediction of the matching AFOQT sections. Accordingly, items were selected with high internal consistency.
- (2) The range of difficulty level for selected items was similar to that for items usually included in an AFOQT.
- (3) No item was selected for use in AFPST-62 which was contained in any other currently operational officer test. This avoids the possibility of enhanced performance on other tests by applicants who have encountered the same items while taking the AFPST.
- (4) Most AFPST items were selected from among those items used in discontinued forms of the AFOQT. This had the advantage of making available for use test items of demonstrated merit which would not be reused.

To satisfy criterion (3), items contained in the current form, AFOQT-G, were eliminated from consideration. Most of the items used in AFPST-62 were selected from AFOQT-F. Items for Background for World Events were selected from new items (not used elsewhere) because such items tend to become obsolete quickly.

### EXPERIMENTAL TRYOUT

A preliminary form of AFPST-62 was printed as the USAF Officer Quality Test. During March 1961, it was administered, along with selected portions of AFOQT-G, to 517 basic airmen with above average scores on the Armed Forces Qualification Test. It was felt that the performance of these selected high-scoring airmen would be similar to that of an officer applicant population.

AFOQT-G was administered using instructions contained in its published manual. Time limits and administrative instructions for AFPST-62 were established from past experience with similar tests.

- A separate score was obtained for each subtest of both the AFOQT and the AFPST. In addition, the total score for AFPST and the Verbal, Quantitative, Officer Quality, and Navigator-Technical composite scores for AFOQT were obtained.

### ANALYSIS OF TRYOUT RESULTS

As a final check on the internal consistency, difficulty level (proportion marking keyed correct answers), and keying of items contained in AFPST-62, each of the five subtests were item analyzed separately. In each case, the criterion used was total score on that subtest. Phi coefficients were computed from the upper and lower 27% of the sample on the criterion. A summary of the results of these item analyses is presented in Table 2.

Intercorrelations, means, and standard deviations of AFOQT subtests and composites and AFPST-62 subtests and total score were computed. These data are presented in the Appendix. The correlation of each subtest of AFPST with its AFOQT equivalent was computed. These correlations are presented in Table 3.

**TABLE 2. Item Internal Consistency and Difficulty Level**

AFPST-62	Nr of Items	Difficulty Level <sup>a</sup>		Phi Coefficient <sup>b</sup>	
		Range	Median	Range	Median
Part 1, Verbal	30	.19-.69	.38	.15-.64	.46
Part 2, Quantitative	30	.21-.80	.48	.33-.83	.62
Part 3, General Science	15	.26-.89	.45	.33-.76	.54
Part 4, Mechanical	30	.18-.75	.44	.23-.67	.50
Part 5, Scale Reading	45	.13-.90	.58	.18-.74	.56

<sup>a</sup>Proportion responding correctly to the item.

<sup>b</sup>Criterion = total score on subtest.

A few minor revisions were made on the basis of the item analyses. The test items constituting each subtest of AFPST-62 are relatively homogeneous, and are spread over an adequate range of difficulty. Inspection of Table 2 indicates a considerable range of internal consistency phi coefficients for the various subtests of the AFPST-62. However, the phi coefficient is, in part, a function of the difficulty of the test item. The further from .50 the difficulty level of an item lies, the smaller the phi that may be obtained for that item. Actually, if the phi coefficients obtained from AFPST-62 were plotted against the difficulty levels for the items, a curvilinear plot would result with the phi coefficients tending to approach the maximum value obtainable for the given difficulty.

It can be seen, from data presented in Table 3 that AFPST-62 correlates adequately with those portions of AFOQT which it was designed to predict.

### SUMMARY AND CONCLUSIONS

AFPST-62 is characterized in terms of its psychometric characteristics. The instrument is composed of test items with high internal consistency, and with adequate spread in difficulty level. The subtests of AFPST-62 correlate well with those portions of AFOQT which they were designed to predict. It is expected that the instrument will serve effectively as a screening device for navigator training applicants. This will be verified by data collected during the first few months of administration.

TABLE 3. Correlation Between Comparable Parts of AFPST-62 and AFOQT-G

Correlation between:		
AFPST-62 Variable	AFOQT-G Variable	r
Part 1, Verbal	Verbal Composite	.81 <sup>a</sup>
Part 2, Quantitative	Quantitative Composite	.85 <sup>a</sup>
Unit weighted sum of Part 1 and Part 2 (Verbal + Quantitative)	Officer Quality Composite	.79 <sup>b</sup>
Part 3, General Science	General Science	.74 <sup>a</sup>
Part 4, Mechanical	Unit weighted sum of Mech Info and Mech Prin	.75 <sup>b</sup>
Part 5, Scale Reading	Scale Reading	.85 <sup>a</sup>
Unit weighted sum of Part 2, Part 3, Part 4, and Part 5 (Quant + Gen Science + Mech + Scale Read)	Navigator-Technical Composite	.91 <sup>b</sup>

<sup>a</sup> Extracted from Appendix.

<sup>b</sup> Computed from the formula:

$$r_{cs} = \frac{\sum r_{ci}\sigma_i}{\sqrt{\sum \sigma_i^2 + 2\sum r_{ij}\sigma_i\sigma_j}} \quad (i < j)$$

(Guilford, 1956, p. 425)

#### REFERENCES

- Guilford, J.P. *Fundamental statistics in psychology and education*. (3rd ed.) New York: McGraw-Hill, 1956.
- Valentine, L.D., Jr. & Creager, J.A. *Officer selection and classification tests: their development and use*. Lackland Air Force Base, Texas: Personnel Laboratory, Aeronautical Systems Division, October 1961. (ASD-TN-61-145)

# APPENDIX

## Intercorrelations, Means, and Standard Deviations of Selected AFOQT-G Scores and AFPST-62 Scores

(Sample: 517 basic airmen with above-average AFQT score, tested in March 1961)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	M	SD
<b>AFOQT-G Composite</b>																								
1 Quantitative																							26.04	27.08
2 Verbal	58																						22.40	24.10
3 Officer Quality	84	77																					14.01	20.69
4 Nav-Tech	84	61	74																				37.58	28.94
<b>AFOQT-G Subtests</b>																								
5 Arith Reas	89	56	79	76																			8.92	4.77
6 Interp of Data	69	42	60	64	58																		6.46	2.47
7 Gen Math	93	54	77	78	76	55																	10.04	6.65
8 Verbal Anal	53	86	68	58	52	40	49																12.80	5.24
9 Vocabulary	47	85	62	48	45	29	47	69															5.79	3.27
10 Read Comp	48	70	59	52	48	38	44	60	55														6.33	2.65
11 Background for World Events	38	70	50	42	37	28	37	51	55	40													5.04	2.65
12 Officer BI	32	22	48	32	29	30	29	24	21	21	15												32.22	8.26
13 Mech Info	16	24	21	37	16	17	11	22	17	21	08	05											12.95	5.59
14 Mech Prin	40	40	42	61	37	34	37	38	29	39	20	10	53										10.28	5.12
15 Gen Science	62	66	65	71	56	44	61	60	55	58	45	19	34	53									11.52	6.63
16 Scale Read	68	46	57	82	62	52	64	45	37	39	36	33	11	35	47								28.59	12.92
17 Aerial Landmarks	38	28	36	62	37	40	32	29	18	23	23	22	13	36	23	45							19.71	9.38
<b>AFPST-62</b>																								
18 Total Score	79	70	76	90	73	58	75	67	58	59	46	31	35	55	74	78	46						53.44	26.89
19 Verbal	55	81	67	57	53	40	52	72	72	59	63	21	16	30	60	46	25	73					7.84	6.38
20 Quantitative	85	57	73	85	76	59	82	55	47	50	35	29	19	44	63	75	41	89	58				10.31	7.98
21 Gen Science	56	62	62	63	51	40	58	56	54	53	42	25	26	40	74	47	23	73	60	62			5.72	3.82
22 Mechanical	37	38	40	57	34	33	31	38	27	37	12	14	66	65	51	33	30	64	32	43	41		9.68	6.66
23 Scale Read	67	43	56	79	61	51	63	42	34	39	31	31	16	36	49	85	47	84	44	74	45	38	20.28	9.58

Note.-Decimal points have been omitted.

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